INSTRUMENT HANDBOOK

Applicable to Serial No. 14655

MODEL bwd 582

T.V. VIDEO WAVEFORM
MONITOR

B.W.D. ELECTRONICS PTY.LTD.
331-333 BURKE ROAD, GARDINER
VICTORIA 3146 AUSTRALIA
Telephone: 25-4425

B.W.D. ELECTRONICS PTY.LTD.
127 BLUES POINT ROAD, NORTH SYDNEY
NEW SOUTH WALES 2060 AUSTRALIA
Telephone: 929-7452

INSTRUMENT HANDBOOK

MODEL bwd .582

1. GENERAL. Model bwd 582 Video Waveform Monitor is a portable self contained, all solid state instrument suitable for both black and white or colour monitoring.

The vertical amplifier is provided with a network that can be switched in to limit the high frequency response to conform to the IRE standard. The normal response provides a 5% level from 50Hz to 4.5MHz.

Internal calibrator produces a selectable .714 or 1V P-P 40kHz square wave for calibrating the vertical amplifier.

The cabinet design is based on a 7" x ½ rack module size permitting bench mounting. 19" x 7" rack mounting or two units side by side in a 7 x 19" rack utilizing bwd rack adaptors.

2. VERTICAL DEFLECTION SYSTEM.

2.1 Deflection Sensitivity: Continuously variable from 0.4V to 4V for 140 IRE units (7cms).

Frequency Response: (Sensitivity 1V for 140 IRE units).

Normal. 50Hz to 4.5MHz +0 -5%
3.5Hz to 8MHz - 3db.

IRE 23S-1 standard.
Flat to 350kHz - 2%
20db down at 4MHz.

NOTE: Amplifier response is adjusted for optimum at a sensitivity of 1V for 140 IRE units. Sensitivity range from .5V to 1.5V for 140 IRE units will not affect the Normal response by more than 5%. Maximum variation over the entire sensitivity range will not exceed 10% of the specified frequency response at 1V.

Linearity: within 2% on the screen.

DC Restorer: Back porch clamping, does not affect colour burst signal.

Signal or Video Input: Bridged 75Ω compensated signal input via two Fernsh sockets. Input socket provides a 75Ω terminated input. Out put socket provides a high impedance (1MΩ approximately) termination.

Signal may be applied with negative going sync pulses (Panel select to Normal) or positive going sync pulses (Panel switch to inverted).

2.2 HORIZONTAL DEFLECTION SYSTEM.

Sweep Rates: (Uncalibrated) 1 Line, 2 lines, 1 frame or 2 frames.
X5 magnifier available for both line and frame selection.

Unblanking: DC coupled to CRT unblanking electrode.

P10
582
138

2. VERTICAL DEFLECTION SYSTEM (Contd.)

Sync: Internal.	Sync obtained from vertical amplifier signal.
External.	Ext trigger input is fitted to rear panel a .5V to 5V composite or non composite negative going sync pulse is required. Rear panel switch selects Internal-External Sync source.
AMPLITUDE CALIBRATOR.	Frequency approximately 40kHz amplitude selectable, .714 or 1V, accuracy 2%.
	External calibrator may be applied through signal OUTPUT socket (1MΩ termination).
2.3 CRT.	5" flat face PDA operating at 2.9kV. Viewing area 8 x 10cm.
Graticule:	Calibrated display area 7 x 10cm Engraved from -40 to +100 every 10 units. Other graticules available to special order. Graticule is provided with variable edge illumination and a green filter to increase contrast ratio.
2.4 POWER REQUIREMENTS.	90V to 135V or 185 to 265V 48 to 65Hz. Internal tappings located on Power Transformer. 30 watts max.
DIMENSIONS.	Bench mounted $7\frac{3}{4}$" high x $8\frac{1}{4}$" wide x $17\frac{1}{4}$" deep overall feet knobs etc. Rack mounted - single or dual units. 7" high x 19" x $16\frac{1}{2}$" deep behind panel. Weight 15 lbs.

3. INSTALLATION INSTRUCTIONS.

3.1 Modelbwd 582 utilises convection cooling to reduce internal temperature rise, Installation should be arranged to ensure ventilation holes in bottom cover are not obstructed nor hot air from other equipments below it allowed to enter and thus increase the internal operating temperature.

3.2 Power supply voltage should be checked against the transformer tapping. If instrument is supplied with standard Australian 3 pin plug on cord and no label attached to power cord transformer will be set to 235V tapping. If tapping has been set for other voltages a label attached to power cord will indicate this.

Transformer tappings are shown below and should be adjusted to suit supply if necessary. Fuse is a .5Amp for 230V use or 1A for 110V operation. Fast blow.

4. OPERATING INSTRUCTIONS (Contd.)

Horizontal Position X5 mag.	When control knob is pulled out trace is expanded X5 irrespective of selection of Time Base switch. Rotation of knob in OUT position move the trace horizontally to permit examination of any point on the display.
Vertical Position.	Moves trace vertically over display area.
Normal - Invert.	Switch permits correct display of video signal irrespective of input polarity.
Normal - IRE.	Two position switch selects amplifier response. Normal - flat from 50Hz to 4.5MHz - 5% IRE - -20db at 4MHz.
Cal. (Preset)	Screwdriver control to set the instrument sensitivity over a 10-1 range.
Cal. - Use.	Three position switch selects either 1V or .714V amplitude calibrate signal or the input video signal to display on CRT..
REAR PANEL:	
Int.-Ext. Sync	When switched to Internal, sync selector uses internal signal display for locking. In Ext. position internal sync is disconnected and composite video or non-composite sync signals applied to Ext. sync socket lock trace. Input should be .5V to 5V amplitude.
Input Socket.	Fernsh input socket with internal 75Ω termination.
Output Socket.	Fernsh socket fitted with switch controls which open 75Ω termination when plug is pushed in.
	When a feed through connection is required feed input cable to Input socket and output to output socket. 75Ω termination is removed but feed through components retain a constant 75Ω impedance.

5. FIRST TIME OPERATION.

5.1 Connect instrument to correct AC power source (see para. 3.2) and set controls as follows:

Time Base	Line 2.
Horizontal Position	Pushed in.
Vertical Position	Centred.
Normal-Invert	Normal,
Normal-IRE	Normal,
Cal - Use	.714 (centre position).
Focus.	Centre.
Intensity	$\frac{1}{4}$ rotation clockwise.
Graticule	Switch on by rotating clockwise.

582
138

INSTRUMENT HANDBOOK

Applicable to Serial No. 14655

MODEL bwd 582

T.V. VIDEO WAVEFORM
MONITOR

B.W.D. ELECTRONICS PTY.LTD.
331-333 BURKE ROAD, GARDINER
VICTORIA 3146 AUSTRALIA
Telephone: 25-4425

B.W.D. ELECTRONICS PTY.LTD.
127 BLUES POINT ROAD, NORTH SYDNEY
NEW SOUTH WALES 2060 AUSTRALIA
Telephone: 929-7452

Current flowing through the output stage is applied to a 10V zener diode D15 to provide a 10V stabilised rail to drive Q1 and Q2, the sync separator circuits and the calibrator. C13 filters signals present in the emitter load of Q8 and 10 and those generated by the calibrator and sync separator circuits.

6.2 Input signals from the vertical amplifier feed via C3 to Q14 phase splitter. Signals appearing at the emitter are in phase with the input whilst those at the collector are inverted. The appropriate signal with negative going sync pulses is selected by S4C which is part of the polarity selector switch S4A & B coupling the input of Q3 and Q4 amplifiers to the input signal. The negative going sync pulses are applied to Q15 grounded emitter stage via C24 and R58. As R58 is connected to ground Q15 is conducting with its collector around 9V. The negative going sync pulse tips will drive the stage further into conduction however, when the sync pulse rises back to black level it immediately cuts of Q15, its collector falls and an amplified, clean sync pulse is developed across R59.

Q16 is another grounded emitter stage which will further clip the sync pulse to ensure no video information is contained in the waveform appearing across R62. Three outputs are taken from R62. The line sync pulses are taken directly to S6A whilst frame pulses are integrated by R67-68 and C28 before connecting to S6A. The third signal is taken via C26 R64 to Q17. The line pulses are differentiated by C26 and clipped by D7, R62 and R63. Equal positive and negative pulses are produced by Q17 across the low impedance loads R66 and R65 with a pulse width of approximately 1μSec.

These pulses are fed to the DC restorer via C5 & 6.

6.3 DC Restorer.

To ensure the signal remains stable on the CRT irrespective of variations in the video content or even sync pulse amplitude particularly when monitoring 'off the air' signals from a T.V. receiver, the signal must be clamped to a particular level. In this model clamping is held at the level of the back porch, directly following the sync pulse but short enough to not intertere with a colour sync burst when present.

The two symetrical 1μSec pulses drive D1 and D2 hard into conduction producing a low impedance at the junction of the diodes ana C4, the clamp voltage being at ground potential. Therefore following each line sync pulse the signal back porch level is clamped to ground and due to the long time constant of the circuit formed by C4, the leakage of D1 and D2 and the gate current of Q3 or Q4 no drift of this level will occur between successive sync pulse. The vertical amplifier is DC coupled from the DC restorer to the deflection plates so restoration is maintained throughout the deflection system.

6.4 The Time Base consists of a sync shaping circuit Q18 - Q20, sweep gate Q22 and 23, Miller Sawtooth generator Q24-26, Auto gate circuit Q21 and horizontal amplifier Q28-30.

Line or frame sync pulses selected by S6A are coupled to Q18 emitter follower isolation stage which drives at low impedance the pulse shaping Schmitt Trigger pair Q19 and 20. Irrespective of the shape or rise time of the input, the signal developed across R77 has a constant amplitude and fast fall time. The negative pulse is differentiated by C35 and used to trigger the time base gate Q22 and Q23. In the quiescent condition awaiting

6. CIRCUIT DESCRIPTION (Contd)

The time base sawtooth is taken from the junction of R104 and R106 via R107 and C43 to the base of Q28. Shift voltages are added to the signal via R100, R109 and RV16 panel preset and in the X5 magnified position by R108, S7 and RV15 front panel shift control. The horizontal amplifier is similar to the vertical output stage being a high voltage balanced cascode stage with preset gain controls between the emitters of Q28 and 30.

Gain is increased by X5 when RV18 is paralleled across RV17.

6.5 The calibrator is an emitter coupled multi vibrator Q11 and Q12 oscillating at approximately 50kHz. The output waveform is clipped on the positive face to eliminate tilt by D16 which conducts at 3.3V when D17 sener conducts. This charges C22 and provides a low impedance clamp source.

RV11 and 12 presets are adjusted for .714 and 1V P-P output.

6.6 Transformer T1 supplies all voltages to the instrument. Low voltages are + and - 50V approx. and +200. -55 is half wave rectified by D6 and filtered by C19, R43 and C20. A further stage of filtering by R119 and C29 reduces the rail to -45V +50V is similarly obtained from half wave rectifier D5 with C17, R42, C18 filters. A further stage of filtering is obtained from R22, R21 and C9 for the +24 rail in the vertical amplifier.

The high voltage for the deflection amplifiers is obtained by doubling an 82V winding by D3, D4, C14 and 15. Separate filters are used for each amplifier. R44 and C10 for the vertical amplitier, R41 and C16 for the horizontal.

The CRT operates on approximately equal + and - voltages. Negative 1400 is full wave doubled by D201 and 202, C201, 2, 3 and 4. +1500 by half wave doubling via C209, D203 and D204..

CRT intensity and focus controls are placed in a divider chain across the -1400 rail. Astigmatism and geometry controls are connected into the low voltage supplies.

7. ALIGNMENT AND MAINTENANCE.

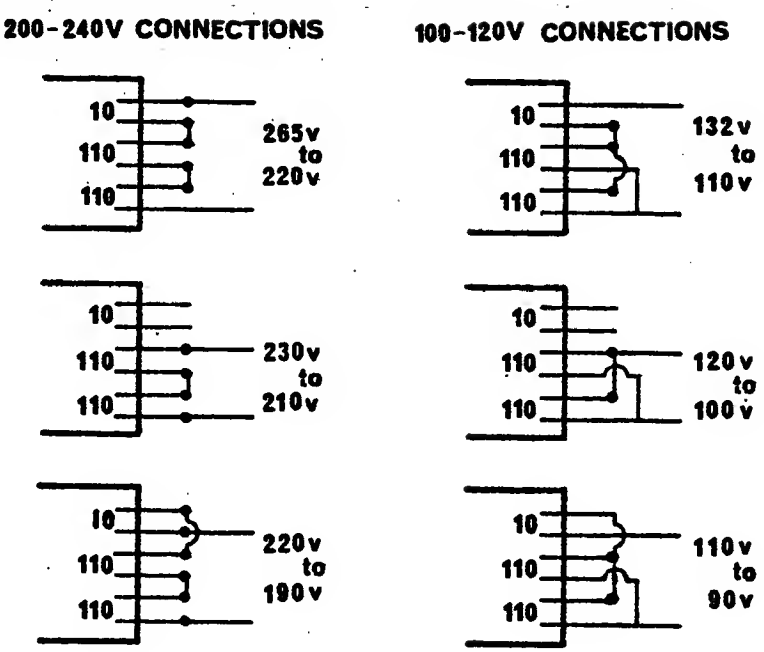
7.1 Access to Model WF 582 can be obtained by removing two screws holding down the handle, this enables the top portion of the cover to be lifted off. Removal of the 4 feet underneath enables the bottom cover to be removed for complete access to all parts.

Complete alignment can be made using a video waveform generator or the video output from a T.V. receiver plus a square wave generator (10 nSec rise time) and a constant amplitude sine wave generator.

7.2 The first adjustment is to set the DC level of the vertical output stage. Switch to 2 frames on Time Base switch with no input. Centre trace vertically. Measure with a 20,000Ω/Volt meter the average voltage on Q27 and Q29 collectors (approximately +95V). Now adjust RV4 (RH rear of board) until average voltage on Q7 and 9 collectors is within 5V of the horizontal amplifier voltage.

3. INSTALLATION INSTRUCTIONS (Contd.)

UNIVERSAL TRANSFORMER CONNECTION



3.3 19" Rack mounted versions will require rack adaptors to convert them for 19" use. For single unit mounting, bwd R76 adaptors are required. For dual mounting, bwd R75 rack adaptor is required. Holes in angle bolting faces conform to standard 19" rack dimensions.

4. OPERATING INSTRUCTIONS.

4.1 FRONT PANEL CONTROLS:

Graticule - OFF	Fully anticlock this control switches off the AC power. Clockwise rotation increases graticule illumination.
Intensity	Controls CRT brightness.
Focus.	Control to adjust the beam for maximum trace sharpness.
Astigmatism. (Preset)	Used initially with focus control to obtain a uniform focus over most of the screen area.
Time Base.	Selects 1 or 2 frame signals or 1 or 2 line signals.
Horizontal Position (Preset)	Adjusts horizontal position of trace when non magnified.

5. FIRST TIME OPERATION (Contd.)

5.2 Adjust the intensity when display appears to a suitable intensity for good viewing and focus for a sharp overall display.

Centre trace and observe display, switch to 1V cal. waveform, adjust CAL preset for 140 IRE units. .714 waveform will now equal 100 units.

5.3 If an external calibration signal is to be used feed it into the OUTPUT socket on rear panel (input impedance 1MΩ) and switch selector to USE. Input frequency of ext. CAL waveform must be greater than 1kHz.

5.4 As Internal calibrate waveform is at 50kHz approximately only two horizontal lines will be displayed in the frame positions of the Time Base switch.

5.5 When a video signal is fed in it should appear with the sync pulses at the bottom of the display, if inverted charge over the Normal-Inverted switch for correct display and recentre trace.

5.6 If it is desired to match the display to the graticule adjust the CAL preset until the sync pulses are equal to 40 divisions with the top of the sync pulse i.e. back and front porch level located on the graticule 0 line. Maximum white video signal should not exceed 100 IRE units on the graticule.

6. CIRCUIT DESCRIPTION.

The monitor will be divided into the following sections:

1. Vertical amplifier.
2. Sync Separator.
3. DC restorer.
4. Time Base and Horizontal Amplifier.
5. Calibrator.
6. Power Supplies and CRT.

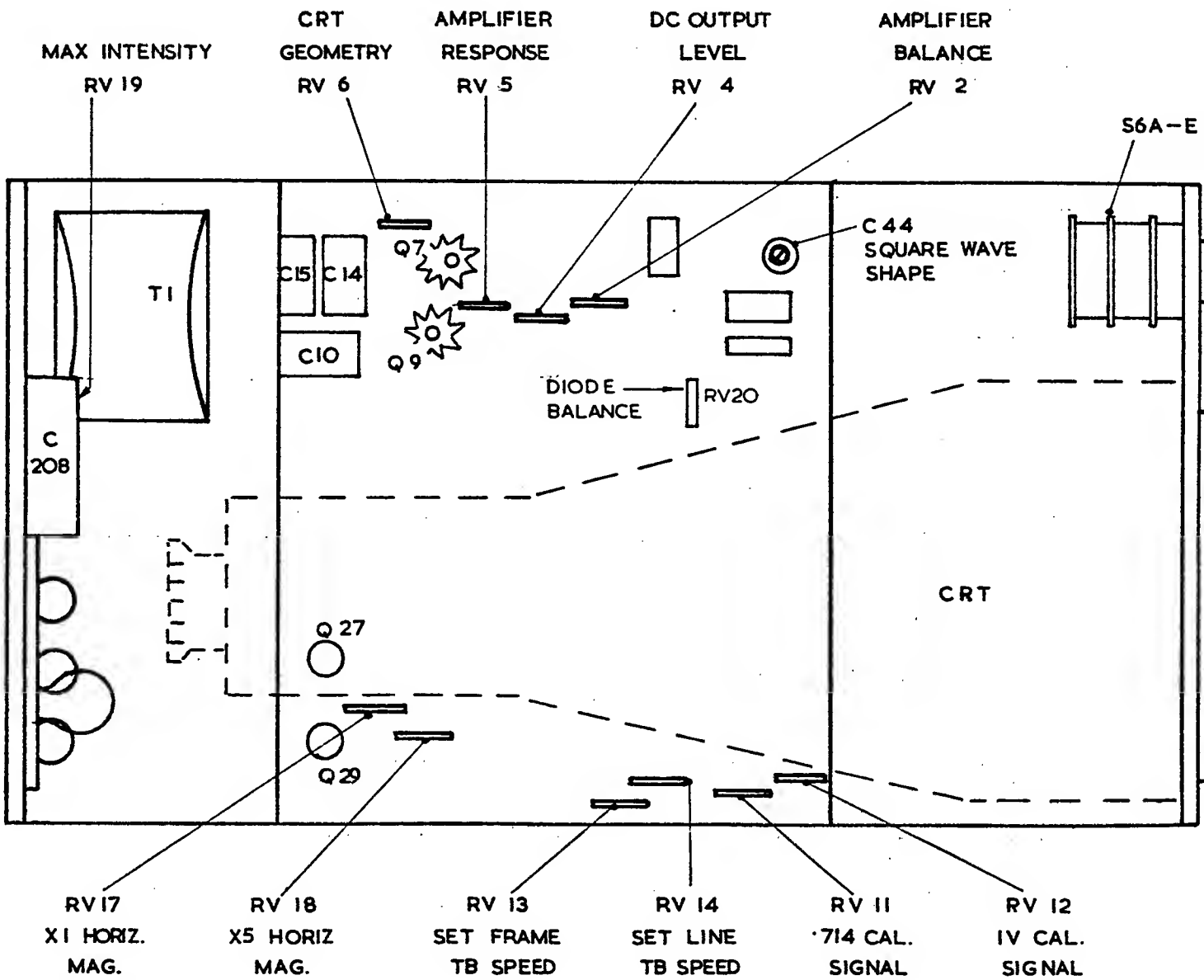
6.1 Input signals applied to the rear panel sockets are taken by co-ax. cable to the Input-Calibrator Selector switch. In the Use position signals are taken through a protection divider R2 C44 and R3 to Q1 FET source follower. Two outputs are taken from the FET, one via C3 to the sync phase splitter and the second via C2 to the front panel CAL control RV1. Output from RV1 drives the base of Q2 emitter follower. This provides a low output impedance to drive the pulse clamp restoration circuit, the IRE filter when switched in by S3A & B and the input amplifiers Q3 & Q4 via Normal-Inverting Switch S4A & B.

Q3, Q4 long tailed pair produces a balanced output across the drain loads which is directly coupled to emitter followers Q5 and Q6.

Vertical positioning is applied to Q3 and Q4 drains via R11 and 16 from RV3 front panel Vertical Position control.

The CRT output deflection amplifier is a high voltage wide band cascode stage consisting of Q7 - 10. Balanced signals applied to Q8 and Q10 bases are amplified and driven into the emitters of Q7 and Q9 high voltage deflection plate drivers high frequency compensation is provided by RV5, C11 and C12. DC levels at the collectors are set by RV4 common emitter resistor.

MODEL 582 VIDEO WAVEFORM MONITOR COMPONENT LAYOUT



Now feed in a 350kHz sine wave and adjust deflection to equal 140 IRE units.

Adjust FOCUS AND ASTIGMATISM for best focus over entire viewing area, then adjust RV6 geometry preset (RH rear of board) for best trace geometry with minimum pin-cushioning or barrel distortion. Turn intensity control fully clockwise, adjust RV19 on rear EHT board until flare is removed from display.

7.3 Feed in a IV square wave calibration signal and adjust vertical gain (Front panel CAL preset) for 140 IRE units. Switch over to 1V CAL waveform, adjust RV12 (RH front of board) for 140 IRE DIV. Switch to .714 cal waveform adjust RV11 for 100 IRE units. The calibrator is now correct.

7.4 VERTICAL AMPLIFIER ALIGNMENT. - Do not move CAL preset during following tests.

Switch input to USE, feed in a 15kHz square wave 100 IRE units amplitude, Time Base at 2 line position. Adjust C44 (front LH side of board) for level tops to square wave - no rounding or overshoot.

Increase frequency to 100kHz square wave. Pull out X5 magnification control.

Adjust C12 and RV5 for optimum square wave with flat top. A slight single ring of approximately 2mm will be present when response is optimised.

Check operation of IRE response, waveform should be rounded with no ringing.

Replace square wave input with sine wave. Set level equal to 100 IRE units at 50kHz. In the normal position, bandwidth should not be greater than 5% down at 4.5MHz and-3db at 8MHz.

In the IRE position bandwidth should be 2% down at 350kHz and greater than 20db down at 4MHz. i.e. 5 IRE division max.

7.5 TIME BASE CALIBRATION.

Feed in a video waveform from a generator on an 'off the air' receiver. Set Time Base to 1 frame. Adjust RV17 preset (Rear LH side of board) for trace length equal to graticule calibration. i.e. 10cm approx. Centre trace with front panel Horizontal Position preset. Check trace position and length at other time base switch settings.

Reset Time Base switch to 1 frame, adjust RV14 until one complete frame signal is visible, switch to 2 frame position to check display. Set RV14 to optimise display between the two positions.

Change to 1 line and adjust RV13 for one complete line display. Switch to 2 lines and optimise setting of RV13 for best display in both positions.

Remove video signal and replace with square wave. Select 2 lines on Time Base, adjust external square wave for 5 complete waveforms equal to length of calibrated graticule. Pull out X5 mag knob then adjust RV18 (LH rear board) until one square wave equals length of calibrated graticule. Check that display can be tracked along to display both ends.

The instrument is now correctly aligned.

a trigger pulse, Q22 will be canducting and Q23 cut aff. Q22 has its collectar at approximately -4V which causes D11 ta canduct and via R87, R89 divider ta bias aff Q23. As the CRT blanking electrode on pin 11 is connected to Q22 collector the CRT is blanked aff whilst D12 cannected to Q23 callector is held above ground by the divider R92, R93 and R90. This causes Q24 saurce to rise, it turns an Q25 causing its collectar and hence Q26 base and emitter ta fall until the junction of R104, R106 and D13 falls ta a valtage which causes D13 ta canduct. Canduction of D13 causes the voltage at the anode of D12 to be reduced as current is now by passed through R106 and 105 ta the -45V rail. A quiescent state is reached where the bypass current thraugh D13 just holds the farward bias valtage on Q24 and hence Q25 at a level which keeps D13 conducting.

On the arrival af negative trigger pulse at Q22 base the transistar is cut off, its collectar rises turning an the CRT beam blanking, Q23 turns on via the valtage divider D11, R87 and R88 permitting its emitter current ta take aver from Q22 so biasing it off completely.

Conduction through Q23 causes its callector valtage to fall reverse biasing D12 and D13 thus leaving the Miller circuit ready to operate. Q24 gate is returned ta a negative voltage via the timing resistars R97-100 as selected by S6D. This tends to cut Q24 aff and reduce the bias on Q25, its callectar rises pulling up Q26 base, its emitter rises and via R104 and C42 change the selected timing capacitars C40 and 41. As the ather end af the timing capacitars are taken back to Q24 gate the positive gaing charge applied is in opposition to the negative fall created by the charging resistors.

As a result of this feed back an extremely linear rising voltage is developed across the Miller transistar Q25 and by the emitter fallawer action across the autput load R105 & 6. It will continue ta rise until the voltage at the junctian af these resistars and D14 reaches approximately -6V when D14 conducts and starts to charge C36 hald-aff capacitar and C33 in the frame pasitians and increase the bias on Q22 base. When the base rises to abaut -3V Q22 canducts, its callectar falls, blanks the CRT, and again cuts aff Q23 sa that its callectar rises, D12 canducts, biases Q25 an hard, its callectar falls together with Q26 until as previously described, D13 canducts and a quiescent conditian is again established.

The base of Q22 will nat fall immediately D14 discannects as the hald aff capacitar will require discharging thraugh R81 and Q22 base current. This time delay is sufficient to prevent triggering befare C40 or C41 have discharged to the quiescent candition.

If no trigger pulse is received the gate circuit Q22 and 23 are automatically operated at a rate slightly longer than the duration of twa lines or two frames as selected by S6.

Q21 controls the auto circuit. During the time the sawtooth waveform is developed Q21 is turned an causing its collectar ta rise to zera and discharge C34 and C31 when switched to frame. At the commencement af the flyback Q21 is cut aff and C34 and C31 can charge negatively via the divider R78, 79, 80 and 81. This steadily reduces the bias on Q22 base until it is unable to hold it in canduction its callectar rises, unblanking the CRT and turning Q23 an thus initiating another trace where no sync signal was present.

MODIFICATIONS

ISSUE 1 11-69

ISSUE 2 4-70
PRODUCTION.

ISSUE 3 5-70
RV19 ADDED
CALIBRATOR REDESIGNED

ISSUE 4 7-70
R44 WAS 3·9K 4W
R120 ADDED
C22 WAS ·1

ISSUE 5 9-70
TRACED

ISSUE 6
INT. EXT. SYNC. SKT. ADDED S8.

SWITCHES

S1	75Ω TERMINATION
S2A & B	USE/CALIBRATE
S3A & B	FLAT - IRE RESPONSE
S4A - C	NORM - INVERT
S5A & B	POWER ON-OFF
S6A - E	TIME BASE SELECTOR
S7A & B	x5 MAGNIFICATION
S8	INT EXT. SYNC.

CONTROLS

RV1	CALIBRATE (AMPL. SENS.)
RV2	VERT. BALANCE
RV3	VERT. POSITION
RV4	AMPLIFIER DC LEVEL
RV5	AMPLIFIER RESPONSE
RV6	GEOMETRY (CRT)
RV7	ASTIGMATISM (CRT)
RV8	FOCUS (CRT)
RV9	INTENSITY (CRT)
RV10	GRATICULE ILLUMINATION
RV11	·714V CAL SIGNAL
RV12	1V CAL SIGNAL
RV13	FRAME TIME BASE PRESET
RV14	LINE TIME BASE PRESET
RV15	HORZ SHIFT - x5 MAG. ONLY
RV16	HORZ POSITION PRESET
RV17	HORZ WIDTH
RV18	HORZ WIDTH x5 MAG.
RV19	SET MAX INTENSITY
RV20	DIODE BALANCE.

ABBREVIATIONS CONTINUED

PL	Plug
PS	Socket
Preset	Internal Preset
PYE	Polyester
pot	Potentiometer
prec	Precision
PC	Printed Circuit
PIV	Peak Inverse Voltage
PYS	Polystyrene
p-p	Peak to Peak
P.Shaft	Plain Shaft
S.Shaft	Slotted Shaft
R	Resistor
rot	Rotary
R log	Reverse Logarithmic Taper
rms	Root Mean Squared
Se	Selenium
SI	Slide
SPDT	Single Pole Double Throw
SPST	Single Pole Single Throw
si	Silicon
Ta	Tantalum
tol	Tolerance
trim	trimmer
V	Volt (s)
var	variable
vdcw	Volts Direct Current Working
w	Watt (s)
ww	Wire Wound
Z	Zener
*	Factory Selected valve average valve may be shown
**	Special Component, no part number assigned

MANUFACTURER ABBREVIATIONS

AC	Allied Capacitors
AEE	AEE Capacitors
AN	Anodeon
AST	Astronic Imports
AWA	Amalgamated Wireless of Aust.
ACM	Acme Engineering Pty.Ltd.
AMP	Aircraft Marine Products (Aust)P/L
AR	A. & R. Transformers
AUS	Australux Fuses
AWV	Amalgamated Wireless Valve Co.
ACA	Amplifier Co. of Aust.
AL	Alpha
ARR	Arrow
BWD	B.W.D. Electronics Pty.Ltd.
BL	Belling & Lee Pty.Ltd.
BR	Brentware (Vic) Pty.Ltd.
CF	Carr Fastener
CAN	Cannon Electrics Pty.Ltd.
CIN	Cinch
D	Ducon Condensor Pty.Ltd.
DAR	Darstan
DIS	Distributors Corporation Pty.Ltd.
ELN	Elna Capacitors (Sonar Elect.P/L)
ETD	Electron Tube Dist.
F	Fairchild Australia Pty.Ltd.
GRA	General Radio Agencies
GES	General Electronic Services
GL	Grelco
HW	Hurtle Webster
HOL	R.G. Holloway
H	Haco Distributors (National)
J	Jabel
MAS	Master Instrument Co. Pty.Ltd.
MUL	Mullard (Aust.) Pty.Ld.
MOR	Morganite (Aust.) Pty.Ltd.
MSP	Manufacturers Special Products (AWA)
McM	McMurdo (Aust.) Pty.Ltd.
NU	NU VU Pty.Ltd.
NAU	A.G. Naunton Pty.Ltd.
PA	Painton (Aust.) Pty.Ltd.
PAL	Paton Elect. Pty.Ltd.
PI	Piher Resistors (Sonar Electronics)
PW	Precision Windings Pty.Ltd.
PH	Philips Electrical Industries Pty.Ltd.
PL	Plessey Pacific
PV	Peaston Vic
RP	Radio Parts Pty.Ltd.
RC	Radio Corporation (Electronic Inds.)
RCA	Radio Corporation of America
RHC	R.H. Cunningham
S	Sonic Electronics Pty.Ltd.
STC	Standard Telephones & Cables
SI	Siemens Electrical Industries
SIM	Simonson Pty.Ltd.
SE	Selectronic Components
TR	Trimax Erricson Transformers
TI	Texas Instruments Pty.Ltd.
TH	Thorn Atlas
UC	Union Carbide
W	Wellyn Resistors (Cannon Elec.P/L)
Y	F.L. Yott Pty.Ltd.
Z	Zephyr Prod. Pty.Ltd.

CCT Ref	DESCRIPTION				Mfr. of Supplier	PART NO.	
	RESISTOR						
R42	1.2KΩ	½w	5%	CC	PI		
R43	470Ω	½w	5%	CC	PI		
R44							
R45	5.6KΩ	½w	5%	CC	PI		
R46	5.6KΩ	½w	5%	CC	PI		
R47	2.2KΩ	½w	5%	CC	PI		
R48	4.7KΩ	½w	5%	CC	PI		
R49	5.6KΩ	½w	5%	CC	PI		
R50	4.7KΩ	½w	5%	CC	PI		
R51	1.5K	½w	5%	CC	PI		
R52							
R53							
R54	68KΩ	½w	5%	CC	PI		
R55	22KΩ	½w	5%	CC	PI		
R56	2.2KΩ	½w	5%	CC	PI		
R57	2.2KΩ	½w	5%	CC	PI		
R58	3.3MΩ	½w	5%	CC	PI		
R59	18KΩ	½w	5%	CC	PI		
R60	1MΩ	½w	5%	CC	PI		
R61	4.7KΩ	½w	5%	CC	PI		
R62	4.7KΩ	½w	5%	CC	PI		
R63	2.2KΩ	½w	5%	CC	PI		
R64	10KΩ	½w	5%	CC	PI		
R65	1KΩ	½w	5%	CC	PI		
R66	1KΩ	½w	5%	CC	PI		
R67	22KΩ	½w	5%	CC	PI		
R68							
R69	680KΩ	½w	5%	CC	PI		
R70	100KΩ	½w	5%	CC	PI		
R71	82KΩ	½w	5%	CC	PI		
R72	10KΩ	½w	5%	CC	PI		
R73	1KΩ	½w	5%	CC	PI		
R74	12KΩ	½w	5%	CC	PI		
R75	33KΩ	½w	5%	CC	PI		
R76	82KΩ	½w	5%	CC	PI		
R77	3.3KΩ	½w	5%	CC	PI		
R78	33KΩ	½w	5%	CC	PI		
R79	6.8K	½w	5%	CC	PI		
R80	2.2KΩ	½w	5%	CC	PI		
R81	220KΩ	½w	5%	CC	PI		
R82	47KΩ	½w	5%	CC	PI		

8. REPLACEMENT PARTS.

As the policy of B.W.D. ELECTRONICS PTY. LTD. is one of continuing research and development, the company reserves the right to supply the latest equipment and make amendments to circuits and parts without notice.

9. GUARANTEE.

The equipment is guaranteed for a period of twelve (12) months from the date of purchase, against faulty materials and workmanship, with the exception of Cathode Ray Tubes, which are covered by their manufacturer's own warranty.

Please refer to Guarantee Registration Card No....9268.....which accompanied instrument, for full details of conditions of warranty.

B.W.D. ELECTRONICS PTY. LTD.

REPLACEABLE PARTS

1. This section contains information for ordering replacement parts, it provides the following details:-

   (a) Description of part (see list of abbreviations).
   (b) Typical manufacturer or supplier of the part (see list of abbreviations).
   (c) Manufacturer's Part Number; and
   (d) Defence Stock Number, where applicable.

2. Ordering - Please quote Model Type No. e.g. bwd 511, Serial No., Circuit reference No. and component details as listed in parts list.

COMPONENT DESIGNATORS

A	Assembly	H	Heater	RV	Resistor Variable
B	Lamp	J	Jack (socket)	S	Switch
C	Capacitor	L	Inductor	T	Transformer
D	Diode	M	Meter	TH	Thermistor
DL	Delay Line	P	Plug	V	Valve
E	Misc.Elect.Part	Q	Transistor	VDR	Voltage Dependent Resistor
F	Fuse	R	Resistor		

ABBREVIATIONS

Amp	Ampere	L	Inductor
C	Capacitor	lin	Linear
cc	Cracked Carbon	Log	Logarithmic Taper
c	Carbon	m	Milli = 10^{-3}
cd	Deposited Carbon	MHz	Mega Hertz = 10^{6}Hz
comp	Composition	MF	Metal Film
CDS	Ceramic Disc Capacitor	ma	Milli Ampere
cer	ceramic	MΩ	Meg Ohm = $10^{6}\Omega$
Com	Common	mfr	Manufacturer
DPST	Double Pole Single Throw	MO	Metal Oxide
DPDT	Double Pole Double Throw	MHT	Polyester/Paper Capacitor
elec	Electrolytic	MPC	Metalised Polyester Capacitor
F	Farad	Ne	Neon
f	Fuse	NPO	Zero temperature co-efficient
FET	Field Effect Transistor	nsr	Not separately replaceable
Ge	Germanium	NC	Normally Closed
H	Henry (ies)	NO	Normally Open
H.S.	High Stability	ns	Nano second
HTC	High Temp Coating	obd	Order by Description
ins	Insulated	OD	Outside Diameter
kHz	Kilo Hertz = 10^{3}Hz	p	Peak
KΩ	Kilohm = $10^{3}\Omega$	pf	pico farad = 10^{-12}F

CCT Ref	DESCRIPTION				Mfr. or Supplier	PART No.	
R203	560K	½w	5%	CC	PI		
R204	560K	½w	5%	CC	PI		
R205	82Ω	½w	5%	CC	PI		
		CAPACITOR					
C1	0.47 µF	200V	10%	PYE	SON	TYPE N	
C2	125 µF	16V		ELEC	PH	C426AR/E125	
C3	10 µF	64V		ELEC	PH	C426AR/H10	
C4	0.01 µF	100V	10%	PYE	SON	TYPE N	
C5	0.01 µF	160V	10%	PYE	PH	C296AR/A10K	
C6	0.01 µF	160V	10%	PYE	PH	C296AR/A10K	
C7	120pf	630V	5%	PYS	AC	TCS106	
C8	32 µF	64V		ELEC	PH	C426AR/H32	
C9	64 µF	64V		ELEC	PH	C437AR/H64	
C10	40 µF	200V		ELEC	PH	C436AR/L40	
C11	330pf	680V	5%	PYS	AC	TCS606	
C12	20-220pf	Trimmer		MICA	DUC	CWO	
C13	125 µF	16V		ELEC	PH	C426AR/E125	
C14	50 µF	150V		ELEC	PH	C436AR/K50	
C15	50 µF	150V		ELEC	PH	C436AR/K50	
C16	40 µF	200V		ELEC	PH	C436AR/L40	
C17	64 µF	64V		ELEC	PH	C437AR/H64	
C18	100 µF	64V		ELEC	PH	C437AR/H100	
C19	64 µF	64V		ELEC	PH	C437AR/H64	
C20	100 µF	64V		ELEC	PH	C437AR/H100	
C21	0.0056	400V	10%	PYE	PH	C	
C22	0.22uF	100V	10%	PYE			
C23							
C24	0.1 µF	100V	10%	PYE	SON	TYPE N	
C25	0.47 µF	100V	10%	PYE	SON	TYPE N	
C26	100pf	500V	10%	N750 CER	AC	CDS	
C27							
C28	0.01 µF	100V	10%	PYE	SON	TYPE N	
C29	100 µF	64V		ELEC	PH	C437AR/H100	
C30	0.01 µF	100V	10%	PYE	SON	TYPE N	
C31	0.64 µF	64V		ELEC	PH	C426AR/H0.64	
C32	22pf	500V	10%	N750 CER	AC	CDS	
C33	0.1 µF	100V	10%	PYE	SON	TYPE N	
C34	0.0047pf	100V	10%	PYE	SON	TYPE N	
C35	10pf	500V	10%	CER	AC	CDS	
C36	0.0022	500V	20%	CER	AC	CDS	

CCT Ref	DESCRIPTION				Mfr. or Supplier	PART No.	
	POTENTIOMETER						
RV14	100KΩ	PRE SET POT		C	PH	E097AC/100K	
RV15	100KΩ	LIN POT DPST Push Pull Switch		C	DUC		
RV16	100KΩ	LIN POT SLOTTED SHAFT		C	SON		
RV17	10KΩ	PRE-SET		C	PH	E097AC/10K	
RV18	1KΩ	PRE-SET		C	PH	E097AC/1K	
RV19	100KΩ	PRE-SET		C	PH	E097AC/100K	
RV20	1MΩ	PRE-SET		C	PH		
	DIODES						
D1	75V	PIV	30mA	Si	PH	IN4148	
D2	75V	PIV	30mA	Si	PH	IN4148	
D3	400V	PIV	500mA	Si	STC	EM404	
D4	400V	PIV	500mA	Si	STC	EM404	
D5	400V	PIV	500mA	Si	STC	EM404	
D6	400V	PIV	500mA	Si	STC	EM404	
D7	75V	PIV	30mA	Si	PH	IN4148	
D8	75V	PIV	30mA	Si	PH	IN4148	
D9	75V	PIV	30mA	Si	PH	IN4148	
D10	75V	PIV	30mA	Si	PH	IN4148	
D11	75V	PIV	30mA	Si	PH	IN4148	
D12	75V	PIV	30mA	Si	PH	IN4148	
D13	75V	PIV	30mA	Si	PH	IN4148	
D14	75V	PIV	30mA	Si	PH	IN4148	
D15	10V	ZENER	400mA	Si	PH	BZY88/C10	
D16	100V	PIV	30mA	Ge	PH	OA91	
D17	3.3V	ZENER	400mW	Si	PH	BZY88/C3U3	
D18							
D19							
D20							
D201	SELENIUM RECTIFIERS				STC	K8/25	
D202	"	"			STC	K8/25	
D203	"	"			STC	K8/25	
D204	"	"			STC	K8/25	
	TRANSISTORS						
Q1	25V	Vds	N CHANNEL FET	Si	TI	2N3819	
Q2	20V	Vce	70 hfe NPN	Si	PH	BF194	
Q3	25V	Vds	N CHANNEL FET	Si	TI	2N3819)	Matched pai
Q4	25V	Vds	N CHANNEL FET	Si	TI	2N3819)	

PARTS LIST MODEL bwd 582 VIDEO MONITOR

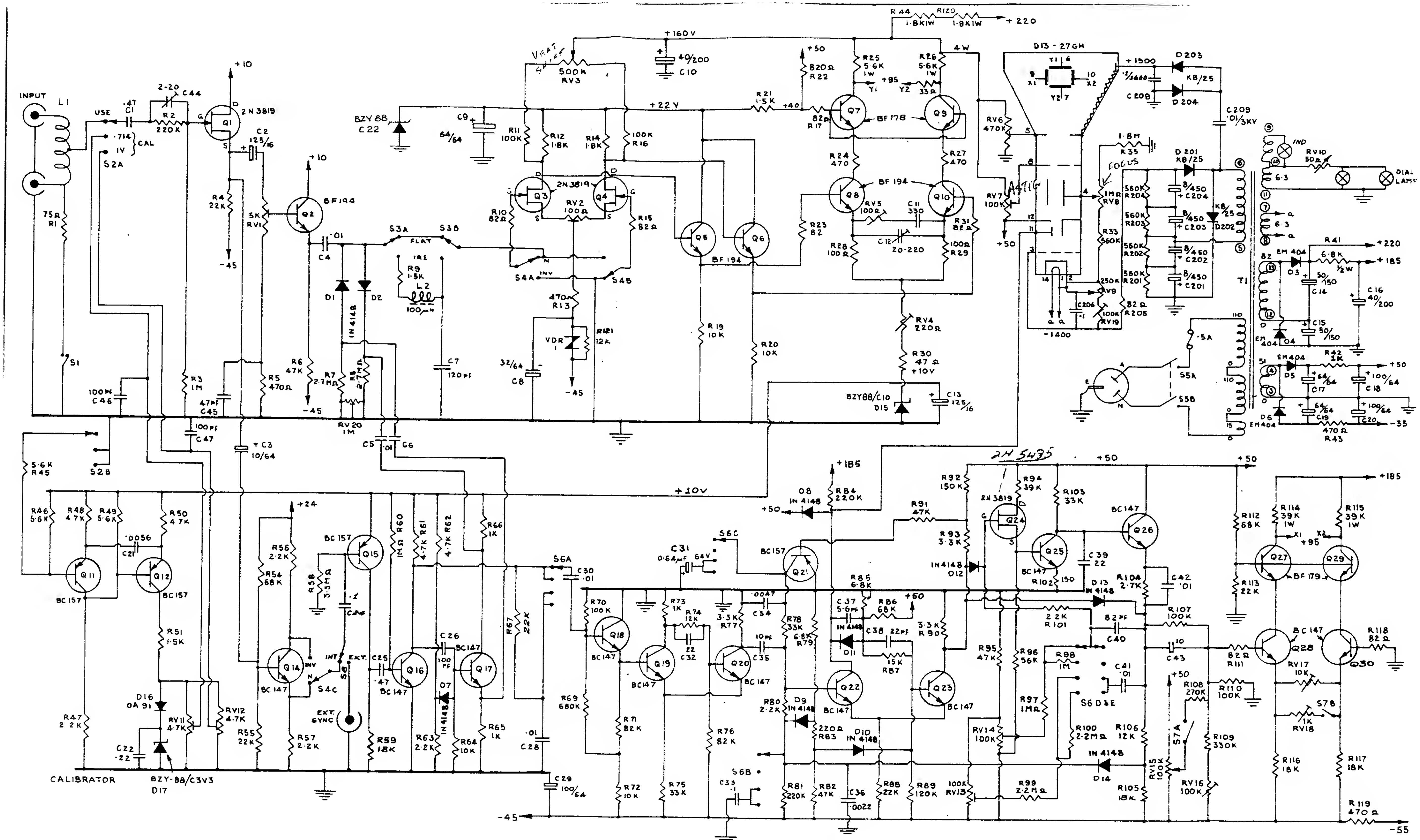
CCT Ref	DESCRIPTION				Mfr. or Supplier	PART No.	
	RESISTOR						
R1	75Ω	TR5	2%	MO	ELECTRICAL		
R2	220KΩ	½w	5%	CC	PI		
R3	1MΩ	½w	5%	CC	PI		
R4	22KΩ	½w	5%	CC	PI		
R5	470Ω	½w	5%	CC	PI		
R6	47KΩ	½w	5%	CC	PI		
R7	2.7M	½w	5%	CC	PI		
R8	2.7M	½w	5%	CC	PI		
R9	1.5KΩ	½w	5%	CC	PI		
R10	82Ω	½w	5%	CC	PI		
R11	100KΩ	½w	5%	CC	PI		
R12	1.8KΩ	½w	5%	CC	PI		
R13	470Ω	½w	5%	CC	PI		
R14	1.8KΩ	½w	5%	CC	PI		
R15	82Ω	½w	5%	CC	PI		
R16	100KΩ	½w	5%	CC	PI		
R17	82Ω	½w	5%	CC	PI		
R18							
R19	10KΩ	½w	5%	CC	PI		
R20	10KΩ	½w	5%	CC	PI		
R21	1.5KΩ	½w	5%	CC	PI		
R22	820Ω	½w	5%	CC	PI		
R23	82Ω	½w	5%	CC	PI		
R24	470Ω	½w	5%	CC	PI		
R25	5.6KΩ	1w	5%	CC	PI		
R26	5.6KΩ	1w	5%	CC	PI		
R27	470Ω	½w	5%	CC	PI		
R28	100Ω	½w	5%	CC	PI		
R29	100Ω	½w	5%	CC	PI		
R30	47Ω	½w	5%	CC	PI		
R31	82Ω	½w	5%	CC	PI		
R32							
R33	560KΩ	1w	5%	CC	PI		
R34							
R35	1.8MΩ	½w	5%	CC	PI		
R36							
R37							
R38							
R39							
R40							
R41	6.8KΩ	½w	5%	CC	PI		

CCT Ref	DESCRIPTION				Mfr. or Supplier	PART No.	
	RESISTOR						
R83	220Ω	½w	5%	CC	PI		
R84	220KΩ	½w	5%	CC	PI		
R85	6.8 KΩ	½w	5%	CC	PI		
R86	68KΩ	½w	5%	CC	PI		
R87	15KΩ	½w	5%	CC	PI		
R88	22KΩ	½w	5%	CC	PI		
R89	120KΩ	½w	5%	CC	PI		
R90	3.3KΩ	½w	5%	CC	PI		
R91	47KΩ	½w	5%	CC	PI		
R92	150KΩ	½w	5%	CC	PI		
R93	3.3KΩ	½w	5%	CC	PI		
R94	39 KΩ	½w	5%	CC	PI		
R95	47KΩ	½w	5%	CC	PI		
R96	56KΩ	½w	5%	CC	PI		
R97	1MΩ	½w	5%	CC	PI		
R98	1MΩ	½w	5%	CC	PI		
R99	2.2MΩ	½w	5%	CC	PI		
R100	2.2MΩ	½w	5%	CC	PI		
R101	2.2KΩ	½w	5%	CC	PI		
R102	150Ω	½w	5%	CC	PI		
R103	33KΩ	½w	5%	CC	PI		
R104	2.7KΩ	½w	5%	CC	PI		
R105	18KΩ	½w	5%	CC	PI		
R106	12KΩ	½w	5%	CC	PI		
R107	100KΩ	½w	5%	CC	PI		
R108	270KΩ	½w	5%	CC	PI		
R109	330KΩ	½w	5%	CC	PI		
R110	100KΩ	½w	5%	CC	PI		
R111	82Ω	½w	5%	CC	PI		
R112	68KΩ	½w	5%	CC	PI		
R113	22KΩ	½w	5%	CC	PI		
R114	39KΩ	1w	5%	CC	PI		
R115	39KΩ	1w	5%	CC	PI		
R116	18KΩ	½w	5%	CC	PI		
R117	18KΩ	½w	5%	CC	PI		
R118	82Ω	½w	5%	CC	PI		
R119	470Ω	½w	5%	CC	PI		
R120							
R121	12K	½w	5%	CC	PI		
R201	560K	½w	5%	CC	PI		
R202	560K	½w	5%	CC	PI		

PARTS LIST MODEL bwd 582 VIDEO MONITOR

CCT Ref	DESCRIPTION	Mfr. or Supplier	PART No.	
	TRANSISTORS			
Q5	20V Vce 70 hfe NPN Si	PH	BF 194	
Q6	20V Vce 70 hfe NPN Si	PH	BF194	
Q7	150V Vce 50mA 1.7W NPN Si	PH	BF178	
Q8	20V Vce 70 hfe NPN Si	PH	BF194	
Q9	150V Vce 50mA 1.7W NPN Si	PH	BF178	
Q10	20V Vce 70 hfe NPN Si	PH	BF194	
Q11	-45V Vce 75 hfe PNP Si	PH	BC157	
Q12	-45V Vce 75 hfe PNP Si	PH	BC157	
Q13				
Q14	45V Vce 125 hfe NPN Si	PH	BC147	
Q15	-45V Vce 75 hfe PNP Si	PH	BC157	
Q16	45V Vce 125 hfe NPN Si	PH	BC147	
Q17	45V Vce 125 hfe NPN Si	PH	BC147	
Q18	45V Vce 125 hfe NPN Si	PH	BC147	
Q19	45V Vce 125 hfe NPN Si	PH	BC147	
Q20	45V Vce 125 hfe NPN Si	PH	BC147	
Q21	-45V Vce 75 hfe PNP Si	PH	BC157	
Q22	45V Vce 125 hfe NPN Si	PH	BC147	
Q23	45V Vce 125 hfe NPN Si	PH	BC147	
Q24	25V Vds N CHANNEL FET Si	TI	2N3819	
Q25	45V Vce 125 hfe NPN Si	PH	BC147	
Q26	45V Vce 125 hfe NPN Si	PH	BC147	
Q27	150V Vce 50mA 1.7W NPN Si	PH	BF179	
Q28	45V Vce 125 hfe NPN Si	PH	BC147	
Q29	150V Vce 50mA 1.7W NPN Si	PH	BF179	
Q30	45V Vce 125 hfe NPN Si	PH	BC147	
	SUNDRIES			
L2	100 µH coil	Selectronics	VPC/100	
VDR1	VDR (0.8w) RED/ORANGE/YELLOW	PH	E2990/P234	
	P/C/BOARD EPOXY GLASS	PROCEL	160/107	
	T05 HEAT SINKS	GES		
	P/C/BOARD EPOXY GLASS	PW	160/072	
	LAMPS LES	GRA	E5/8	
	RED BRACKET LAMP	SON	3280	
S1	ON BACK OF INPUT SOCKET	PYROX	FERNSH	
S2	2 POLE 3POS SL SW	HAYCO	RQ153S	
S3	2 POLE 2POS SL SW	SON	3570	
S4	3 POLE 3POS SL SW	McMURDO		
S5	ON BACK OF POT 50Ω 2W WW	IRH		

CCT Ref	DESCRIPTION	Mfr. or Supplier	PART No.	
	SUNDRIES			
S6	2 POLE 4 POS 3 DECK	AWA	TYPE F	
S7	ON BACK OF POT 100KA with Push-Pull DPST	DUC		
T1	POWER TRANSFORMER	ERIC	TP5698	
	CRT D13-27GH WITH SOCKET	PH	PH	
	SOCKET CO-AX	PYROX	FERNSH	
	SOCKET CO-AX WITH SWITCH	PYROX	FERNSH	
	FUSE CARTRIDGE 3AG	YOTT	0.5AMP	
	POWER CORD c/w PLUG	PEAS		
	ALL OTHER ITEMS ORDER BY DESCRIPTION			



NOTE :-
COMPONENT VALUES MAY OCCASIONALLY VARY FROM THOSE DESIGNATED DUE TO SUPPLY OR TO OPTIMISE PERFORMANCE

ISSUE	582	BWD ELECTRONICS P/L. MELBOURNE AUSTRALIA	DRG. No.
6 / 8-71	DRAWN: TRACED: CHECKED: DATE:	MODEL bwd 582 VIDEO MONITOR	825